IMMUNO BIOLOGY

THE IMMUNE SYSTEM IN HEALTH AND DISEASE

FOURTH EDITION

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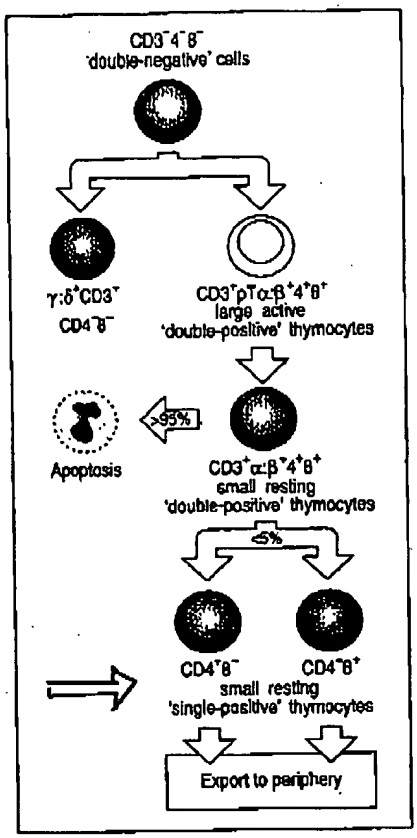

Fig. 7.6 Changes in cell-surface molecules allow thymocyte populations at different stages of maturation to be distinguished. The most important cell-surface molecules for identifying thymocyte subpopulations have been CD4, CD8, and T-cell receptor complex molecules (CD3, and α and β chains). The earliest cell population in the thymus does not express any of these. As these cells do not express CD4 or CD8, they are called 'double-negative' thymocytes. (The γ:δ T cells found in the thymus also lack CD4 or CD8 but these are a minor population.) Maturation of α:β T cells occurs through stages where both CD4 and CD8 are expressed by the same cell, along with the pre-T-cell receptor (pTα:β) and later low levels of the T-cell receptor (α:β) itself. These cells are known as 'double-positive' thymocytes. Most thymocytes (~97%) die within the thymus after becoming small double-positive cells. Those whose receptors bind self MHC molecules lose expression of either CD4 or CD8 and increase the level of expression of the T-cell receptor. The outcome of this process is the 'single-positive' thymocytes, which, after maturation, are exported from the thymus as mature single-positive T cells.

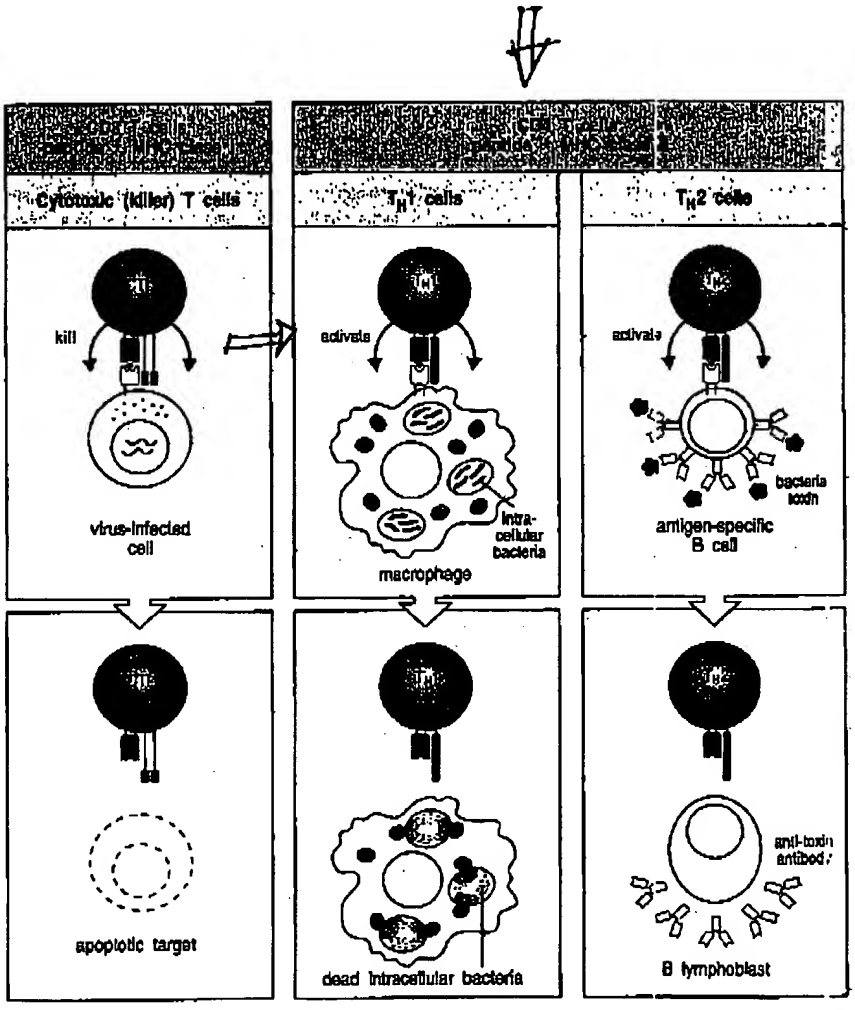

Fig. 8.26 There are three classes of effector T cell, specialized to deal with three classes of pathogen. CD8 cytotoxic cells (left panels) kill target cells that display antigenic fragments of cytosolic pathogens, most notably viruses, bound to MHC class I molecules at the cell surface. T_H1 cells (middle panels) and T_H2 cells (right panels) both express the CD4 co-receptor and recognize fragments of antigens degraded within intracellular vesicles, displayed at the cell surface by MHC class II molecules. The T_H1 cells, upon activation, activate macrophages, allowing them to destroy intracellular microorganisms more efficiently; they can also activate B cells to produce strongly opsonizing antibodies belonging to certain IgG subclasses (IgG1 and IgG3 in humans, and their homologs IgG2a and IgG2b in the mouse). T_H2 cells, on the other hand, drive B cells to differentiate and produce immunoglobulins of all other types, and are responsible for initiating B-cell responses by activating naive B cells to proliferate and secrete IgM. The various types of immunoglobulin together make up the effector molecules of the humoral immune response.